I. AMENDMENTS TO THE SPECIFICATION

Kindly replace the title at line 1 of page 1 to line 2 of page 1 with the following:

METHOD ~~AND APPARATUS~~ FOR IMMOBILIZING A ~~FRAMING~~ FRAME STRUCTURE IN ITS FREE STATE TO ESTABLISH A NET DATUM POSITION

Kindly replace the section heading at line 12 of page 1 with the following:

2. DESCRIPTION OF THE ~~PRIOR~~ RELATED ART

Kindly replace the paragraph beginning at line 16 of page 2 and ending at line 22 of page 2 with the following:

There are at least two well-known attempts to ~~solving~~ solve this problem. First, many manufacturers use a frame straightening process in an attempt to correct the warping. The frame straightening process, however, tends to be an exercise in futility since the process introduces additional built-in stress to the chassis frame and can lead to further displacement of the rails and cross member structure. Such frame straightening processes are rarely, if ever, capable of reliably straightening the entire chassis frame back into its exact design-intent geometry.

Kindly amend the paragraph beginning at line 8 of page 5 and ending at line 21 of page 5 as follows:

U.S. Patent 5,987,726 to Akeel identifies a general problem with assembling body panels, wherein internal stresses are built into body assemblies. Therefore, Akeel teaches the use of programmable body panel positioners for compliant positioning of body panels or tooling during assembly operations to achieve a stress-free vehicle body assembly. Akeel discloses a parallel link mechanism having a base plate, a locator plate spaced above the base plate, and three pairs of linear actuator links attached between the base and locator plates by universal joints. Either a tool or a body panel member is clamped to the locator plate for processing the body panel member. The actuators are screw drives for changing the length of each link in a corrective manner in response to variation in processing forces. A feedback control system, including force sensors and encoders, is communicated with the links so that the actuators react to processing forces for increasing the holding force on the body panel member for higher support rigidity, or to decrease the holding force for controlled compliance and a stress free assembly.

Kindly replace the section heading at line 10 of page 6 with the following:

BRIEF SUMMARY OF THE INVENTION

Kindly replace the section "BRIEF DESCRIPTION OF THE DRAWINGS" beginning at line 10 of page 8 and ending at line 21 of page 8 with the following:

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

~~Fig~~. Figure 1 is a perspective view of a schematic of a chassis frame or carriage in a workstation;

~~Fig~~. Figure 2 is a perspective view of a portion of one rail of a chassis frame that is located within an acceptable tolerance range, and is found by an immobilizer apparatus according to a preferred embodiment of the present invention;

~~Fig~~. Figure 3 is a plan view of the portion of the chassis frame and the locator and immobilizer apparatus shown in ~~Fig~~. Figure 2;

~~Fig~~. Figure 4 is a side view of the portion of the chassis frame and locator and immobilizer apparatus shown in ~~Fig~~. Figure 2; and

~~Fig~~. Figure 5 is a side view of the chassis frame and a locator and immobilizer apparatus according to an alternative embodiment of the present invention.

Kindly replace the paragraph beginning at line 3 of page 11 and ending at line 21 of page 11 with the following:

Therefore, as long as the chassis frame 10 is within the acceptable tolerance variation limit, it is preferable to find or locate the chassis frame 10 wherever it is in its free state ~~and~~ rather than forcibly clamp the chassis frame 10 back toward its nominal or design-intent position. In this manner, the chassis frame 10 is not distorted or displaced by the immobilizing devices I, as would be the case using a prior art clamping method. According to the present invention, the immobilizing devices I simply find and then confine, restrict, or restrain the chassis frame 10 from moving from its free state, such that the chassis frame 10 is immobilized in its free state during operations that are performed thereupon, such as forming, drilling, or fastening operations. In this way, formed pads, holes, fasteners, and

other features are fabricated in net datum ~~position~~ positions on the chassis frame 10, at their design-intent location, with respect to the position of the chassis frame 10 that is established by the rest buttons R and pins 2 and 4. More importantly, these ~~welds~~ formed pads, holes, fasteners, and other features remain at design-intent location even after the chassis frame 10 is released from the immobilizing devices I since the force of the immobilizing devices I is equalized from both sides of the chassis frame and cancels itself out so that no external load is applied to the frame in its free state location. The present invention is not limited to only the above-mentioned operations on vehicle chassis frames, but is also applicable to any other carriage or frame structure. The immobilizing devices I will now be described in structural detail below.

Kindly replace the paragraph beginning at line 15 of page 12 and ending at line 9 of page 13 with the following:

With regard to each of the front and rear dual-axis immobilizing devices 22A and 22B, there is shown ~~an~~ a hydraulic unit, or lower work support 26, bolted to the workstation platen 20, directly underneath the chassis frame 10. Positioned just inboard of the right-hand rail 12 of the chassis frame 10, is an inboard stanchion or support 28 bolted to the workstation platen 20. In turn, an inboard work support 30 is bolted to the top of the inboard stanchion 28. Opposite the inboard work support 30, a transfer assembly 32 is shown bolted to the workstation platen 20. The transfer assembly 32 includes a riser plate 34 bolted to the workstation platen 20 and supporting a pair of guide rails 36 bolted thereto. In turn, the guide rails 36 support pillow blocks 38 bolted to the bottom of a transfer plate 40. The transfer plate 40 supports a transfer stanchion or support 42 extending upwardly

therefrom, the transfer stanchion 42 supports an upper mounting block 44 that is bolted thereto, and the upper mounting block 44 supports an upper work support 46 with a ~~bolting~~ bolted arrangement, directly opposite the lower work support 26. The upper work support 46 is aligned with respect to the lower work support 26 such that the operational axes of the work supports 26 and 46 are coaxial. Similarly, the transfer stanchion 42 supports an outboard mounting block 48 that is bolted to the side thereof and that has an outboard work support 50 bolted thereto. The outboard work support 50 is aligned with respect to the inboard work support 30 such that the operational axes of the outboard and inboard work supports 50 and 30 are coaxial.

Kindly replace the paragraph beginning at line 15 of page 14 and ending at line 2 of page 15 with the following:

In accordance with the present invention, the preferred operation and method first involves loading the chassis frame 10 to the dual-axis immobilizing devices 22A and 22B by an overhead gantry (not shown). As illustrated by the rear dual-axis immobilizing device 22B in ~~Fig~~. Figure 2, the transfer assembly 32 and work supports 26, 30, 46, and 50 must be fully retracted to their home positions, to provide clearance for the chassis frame 10 to enter the workstation. The chassis frame 10 is loaded to the front and rear dual-axis immobilizing devices 22A and 22B such that it rests on a chassis frame fixture having pins and rest buttons, not shown here, but as described previously with respect to Figure 1. Still referring to Figure 2, the guide posts 24 mounted to the workstation platen 20 help guide the chassis frame 10 into the correct position with respect to the front and rear dual-axis

immobilizing devices 22A and 22B and thereby help avoid collision of the chassis frame 10 with the work supports 26, 30, 46, and 50.

Kindly replace the paragraph beginning at line 21 of page 15 and ending at line 6 of page 16 with the following:

Once each transfer assembly 32 is advanced to an advanced position, each plunger 52 is then individually pneumatically advanced from a retracted position in order to find respective opposite portions of the chassis frame 10 wherever it may be located within its tolerance range and thereby establish an advanced position for each plunger 52, as best shown in ~~Fig~~. Figure 4. Referring again to Figure 2, and as mentioned above, the work supports 26, 30, 46, and 50 are oriented such that the plungers 52 are coaxially aligned in opposed orientation. Each plunger 52 continues to advance individually until the respective pad 52A finds the surface of the chassis frame. Upon finding the chassis frame 10, the plungers 52 cease any further advancement so as not to deflect or displace the chassis frame 10.

Kindly amend the paragraph beginning at line 12 of page 17 and ending at line 2 of page 18 as follows:

Once the chassis frame 10 is immobilized as described above, desired manufacturing operations, such as forming, piercing, or fastening, are then performed upon the chassis frame 10 to produce net datum features as more fully described in U.S. Patent 4,760,633 to Dacey, Jr., owned by the common assignee hereof and incorporated herein by reference. The desired features are produced in the chassis frame 10 in its free state and located net with respect to the rest buttons and pins of its chassis frame fixture.

In other words, in the absence of any clamping forces upon the chassis frame 10, the desired features are manufactured net to the chassis frame fixture, and thereby net to design-intent and the theoretical centerline of the chassis frame 10. Accordingly, the desired features will remain in position, as manufactured, with respect to the theoretical centerline of the chassis frame 10, from workstation to workstation, without being deflected or displaced by the work immobilizing apparatus. Alternatively, a piercing apparatus similar to that disclosed in the '026 Dacey, Jr. device, as described in above, can be used in addition to the present invention in order to pierce a hole relative to a specific net datum feature on the chassis frame 10.

Kindly replace the paragraph beginning at line 5 of page 19 and ending at line 13 of page 19 with the following:

Work supports ~~90~~ 92 are fixed to the upper and lower platens 78 and 80 respectively such that plungers ~~92~~ 90 of the work supports contact locking surfaces 86A and 88A of the upper and lower pads 86 and 88. Similarly, a pair of opposed threaded body cylinders 94 are disposed between the upper and lower pads 86 and 88 such that they are oppositely fastened, one into the upper pad 86 and one into the lower pad 88, and have plungers 96 that find workpiece contact surfaces 86B and 88B of the respective opposite upper and lower pads 86 and 88. Preferably, the work supports ~~90~~ 92 are a Hytec model 100998 spring advance type, and the threaded body cylinders 94 are a Hytec model 11AA spring return type, or equivalent.

Kindly replace the paragraph beginning at line 21 of page 19 and ending at line 19 of page 20 with the following:

Once the chassis frame 10 is loaded to the workstations, the immobilizing device 60 advances from its home position to its advanced position, as described above in the preferred embodiment. Accordingly, the upper and lower pads 86 and 88 respectively extend over and under the chassis frame 10 such that the chassis frame 10 is in position therebetween. The distance between the upper and lower pads 86 and 88 in the extended position is such that each pad 86 and 88 is nominally spaced from the respective surface of the chassis frame 10. The spacing is equal to the chassis frame 10 positional tolerance, for example 8 mm as stated previously, from a nominally sized and positioned chassis frame 10. Due to the spring advance, each of the work supports ~~90~~ 92 is in constant contact with its respective upper and lower pad 86 and 88. Pressure is then slowly relieved from each of the threaded body cylinders 94, until the spring force of the work supports ~~90~~ 92 advances the plungers ~~92~~ 90, and thereby the upper and lower pads 86 and 88 into contact with the chassis frame 10 in order to find respective opposite portions of the chassis frame 10 and thereby establish an advanced position for each upper and lower pad 86 and 88. As with the pneumatic pressure described in the preferred embodiment, the spring force of the work supports ~~90~~ 92 is selected such that the spring force is sufficient to displace the pads 86 and 88 but is insufficient to deflect or displace the chassis frame 10 upon contact therewith. In other words, upon finding the chassis frame10, the upper and lower pads 86 and 88 cease any further advancement so as not to deflect or displace the chassis frame 10. In summary, each pad 86 and 88 finds respective opposite portions of the chassis frame 10 without measurably displacing the chassis frame 10 despite where the chassis frame 10 is relative to the chassis frame fixture, within acceptable tolerance limits.

Kindly replace the paragraph beginning at line 20 of page 20 and ending at line 6 of page 21 with the following:

Once the upper and lower pads 86 and 88 have found the chassis frame 10 and are in contact therewith, sleeves (not shown) within the work supports ~~90~~ 92 hydraulically lock the plungers 92 90 in place in their advanced position. As such, the work supports ~~90~~ 92 do not hydraulically advance the plunger ~~92~~ 90. Rather, the work supports 92 constrain the plungers ~~92~~ 90 from any axial movement. Likewise, the plungers ~~92~~ 90 do not impart any force along their respective axes to the pads or the chassis frame 10. In this way, the chassis frame 10 is gently or passively immobilized, trapped, constrained, restricted, or restrained by the upper and lower pads 86 and 88 so that there is no gap or slack between the pads 86 and 88 and the chassis frame 10. In contrast, the chassis frame 10 is not forcibly or actively clamped, clenched, or gripped by the upper and lower pads 86 and 88.

Kindly replace the paragraph beginning at line 7 of page 21 and ending at line 15 of page 21 with the following:

After the chassis frame 10 is immobilized as described above, desired manufacturing operations, such as forming, piercing, or fastening, are then performed upon the chassis frame 10 to produce desired features, as described in the preferred embodiment. Once such operations have been completed, the work supports ~~90~~ 92, and hence plungers ~~92~~ 90, are unlocked by releasing the hydraulic pressure applied thereto. The threaded body cylinders 94 are actuated to advance their plungers 96 and thereby overcome the spring force of the work supports ~~90~~ 92 and hence spread the upper and lower pads 86 and 88